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Research Abstracts

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CURRENT NACA REPORTS

NACA RM E51D13

OBSERVATIONS ON BAUSCHINGER EFFECT IN COPPER AND BRASS. H. Schwartzbart, M. H. Jones and W. F. Brown, Jr. June 19, 1951. 37p. diagrs., photo. (NACA RM E51D13)

The effect of prestrain in tension upon the stress-strain characteristics in compression has been determined for copper and several brasses. The Bauschinger effect was studied as a function of prestrain for an electrolytic copper. The effect of stress relief annealing on the Bauschinger effect was determined for copper and brass. In addition, tensile tests were made on cubically alined copper sheet prestrained in the longitudinal direction and subsequently tested in the transverse direction.

NACA RM E51D20

EXPERIMENTAL INVESTIGATION OF FLOW IN THE ROTATING PASSAGES OF A 48-INCH IMPELLER AT LOW TIP SPEEDS. Donald J. Michel, Ambrose Ginsburg and John Mizisin. June 26, 1951. 37p. diagrs., photo., tab. (NACA RM E51D20)

A preliminary study of the flow in the rotating passages of a 48-inch-diameter radial-inlet centrifugal impeller is made at low tip speeds. The total- and static-pressure distributions at several radii along the blade faces and across the passage are presented. A comparison of pressure variation from hub to shroud is also given.

NACA Rept. 976

LINEAR THEORY OF BOUNDARY EFFECTS IN OPEN WIND TUNNELS WITH FINITE JET LENGTHS. S. Katzoff, Clifford S. Gardner, Leo Diesendruck and Bertram J. Eisenstadt. 1950. 37p. diagrs., photo. (NACA Rept. 976. Formerly TN 1826)

Boundary conditions are defined and discussed for the problem of wind-tunnel boundary interference in an open wind tunnel having closed entrance and exit sections. Electrical analogies that might be used for solving the flow are outlined, and analytical solutions, with numerical results, are given for two-dimensional and circular open tunnels.

NACA TM 1282

THEORY OF FLAME PROPAGATION. (K Teorii Rasprostranenia Plameni). Y. B. Zeldovich. June 1951. 39p. diagrs. (NACA TM 1282. Trans. from Zhurnal Fizicheskoi Khimii, v.22, 1948, p.27-49).

Equations are presented for heat conduction and diffusion in a flame, taking into account the chemical reaction. Temperature distribution in the flame and conditions required for a constant flame velocity are considered. A method is given for determining the flame velocity for a given relation between diffusion and heat conduction by numerical integration and its uniqueness is demonstrated. Equations are also given for flame propagation in a chain reaction.

NACA TM 1291

ON STABILITY AND TURBULENCE OF FLUID FLOWS. (Über Stabilität und Turbulenz von Flüssigkeitsströmen). Werner Heisenberg. June 1951. 60p. diagrs. (NACA TM 1291. Trans. from Annalen der Physik, v.74, no.15, 1924, p.577-627).

This investigation is divided into two parts, the treatment of the stability problem of fluid flows on the one hand, and that of the turbulent motion on the other. The first part summarizes all previous investigations under a unified point of view, that is, sets up as generally as possible the conditions under which a profile possesses unstable or stable characteristics, and indicates the methods for solution of the stability equation for any arbitrary velocity profile and for calculation of the critical Reynolds number for unstable profiles. In the second part, under certain greatly idealizing assumptions, differential equations for the turbulent motions are derived and from them qualitative information about several properties of the turbulent velocity distribution is obtained.

NACA TM 1296

ON THE THEORY OF COMBUSTION OF INITIALLY UNMIXED GASES. (K Teorii Gorenia Neperemeshannykh Gazov). Y. B. Zeldovich. June 1951. 20p. diagrs. (NACA TM 1296. Trans. from Zhurnal Tekhnicheskoi Fiziki, v.19, no.10, Oct. 1949, p.1199-1210).

Presents theoretical study of laminar diffusion flames. Assuming high rates of chemical reaction with attendant small thicknesses of the reaction zone and no loss of heat by radiation or to cold surfaces, equations are developed for the position of the reaction zone, the distribution of reactants, and the flame temperatures within the reaction zone. The position of the flame surface can also be calculated for various flows of fuel and air and for various heats of combustion of the fuel. Equations are developed for determining the combustion limits of diffusion flames.

NACA TN 2372

RECTANGULAR-WIND-TUNNEL BLOCKING CORRECTIONS USING THE VELOCITY-RATIO METHOD. Rudolph W. Hensel, Southern California Cooperative Wind Tunnel, California Institute of Technology. June 1951. 40p. diagrs. (NACA TN 2372)

Calculations of the ratios of the velocity increments at test bodies to those at the tunnel walls caused by the solid blocking of these bodies within the walls of a closed rectangular wind tunnel are presented. The bodies treated include two-dimensional airfoils; small bodies of revolution; straight, untapered, finite-span wings of varying span; and swept, untapered, finite-span wings of varying span. It is shown that, after wake blocking effects have been removed, the present method furnishes semiempirical blocking corrections for most wind-tunnel models and their components. The test-section proportions of the Southern California Cooperative Wind Tunnel at CIT (ratio of height to width equal to $1/\sqrt{2}$) are used in the calculations.

NACA TN 2377

EFFECT OF FUEL IMMERSION ON LAMINATED PLASTICS. W. A. Crouse, Margie Carickhoff and Margaret A. Fisher, National Bureau of Standards. June 1951. 34p. diagrs., photos., 9 tabs. (NACA TN 2377)

Effects of cyclic and continuous immersion in heptane, toluene, and SR-6, a test fuel, on the weight, dimensions, and flexural properties of 19 samples of laminated plastics were determined. No one sample exhibited smaller changes than all other samples for all fuels and for both cyclic and continuous immersion. The best weight and dimensional stability in the cyclic test was shown by a glass-fabric unsaturated-polyester laminate. The changes in flexural strength as well as in flexural modulus of elasticity were losses in the majority of cases after both the cyclic and continuous immersion tests.

NACA TN 2379

AN INVESTIGATION OF THE EFFECTS OF JET-OUTLET CUT-OFF ANGLE ON THRUST DIRECTION AND BODY PITCHING MOMENT. James R. Blackaby. June 1951. 39p. diagrs., photos., tab. (NACA TN 2379)

Wind-tunnel tests were made at low speeds to determine the effect on the pitching moment of a body of revolution of an unheated, subsonic air jet exhausting from the tail of a body through outlets cut off at various angles. Outlets cut off at angles of 0°, 30°, 60°, and 75°, measured from a plane normal to the axis of the body, were tested. In addition, visual studies were made in the region of the outlets with the jets exhausting into still air. The tests indicated that cutting off the outlet at the various angles had only a very small effect on the pitching moment of the body.

NACA TN 2380

EFFECTIVENESS OF CERAMIC COATINGS IN REDUCING CORROSION OF FIVE HEAT-RESISTANT ALLOYS BY LEAD-BROMIDE VAPORS. Dwight G. Moore and Mary W. Mason, National Bureau of Standards. June 1951. 24p. diagrs., photos., 4 tabs. (NACA TN 2380)

A study is presented of the corrosive attack of lead-bromide vapors in an air atmosphere on uncoated, preoxidized, and ceramic-coated specimens of five heat-resistant alloys. After exposure to the vapors for 6 hours at temperatures of 1350°, 1500°, and 1650° F, a fairly rapid corrosion and a loss of thickness of the uncoated and preoxidized specimens occurred. At the same conditions, ceramic-coated specimens showed no significant attack.

NACA TN 2381

EFFECT OF HORIZONTAL-TAIL LOCATION ON LOW-SPEED STATIC LONGITUDINAL STABILITY AND DAMPING IN PITCH OF A MODEL HAVING 45° SWEPTBACK WING AND TAIL SURFACES. Jacob H. Lichtenstein. June 1951. 26p. diagrs., photo., 3 tabs. (NACA TN 2381)

Wind-tunnel results are presented to show the effect of changes in horizontal-tail location on the low-speed static longitudinal stability and steady-state rotary damping in pitch for a complete model with wing and tail surfaces having the quarter-chord lines swept back 45°.

NACA TN 2382

EFFECT OF HORIZONTAL-TAIL SIZE AND TAIL LENGTH ON LOW-SPEED STATIC LONGITUDINAL STABILITY AND DAMPING IN PITCH OF A MODEL HAVING 45° SWEPTBACK WING AND TAIL SURFACES. Jacob H. Lichtenstein. June 1951. 32p. diagrs., photo., 3 tabs. (NACA TN 2382)

Wind-tunnel results of the effects of horizontal-tail size and length on the low-speed static longitudinal stability and the steady-state rotary damping in pitch for a complete model with wing and tail surfaces having the quarter-chord lines swept back 45° and aspect ratios of 4 are presented.

NACA TN 2385

FUNDAMENTAL AGING EFFECTS INFLUENCING HIGH-TEMPERATURE PROPERTIES OF SOLUTION-TREATED INCONEL X. D. N. Frey, J. W. Freeman and A. E. White, University of Michigan. June 1951. 70p. diagrs., photos., 6 tabs. (NACA TN 2385)

Studies were made of the mechanisms by which various aging treatments influenced the mechanical properties of solution-treated Inconel X alloy. Microstructure analyses at the various aged conditions were made by means of X-ray diffraction studies and optical- and electron-micrographic examinations. Correlations of the mechanical properties with the structural analyses and comparisons with the previously determined aging effects on low-carbon N-155 alloy are presented.

NACA TN 2387

THREE-DIMENSIONAL UNSTEADY LIFT PROBLEMS IN HIGH-SPEED FLIGHT - THE TRIANGULAR WING. Harvard Lomax, Max. A.

Heaslet and Franklyn B. Fuller. June 1951. 62p. diagrs. (NACA TN 2387)

The indicial lift and pitching-moment coefficients are derived for flat-plate triangular wings at supersonic speeds. Coefficients are determined for angle-of-attack distributions corresponding to sinking and pitching wings. The wing with supersonic edges is completely analyzed, the wing with subsonic edges is partially analyzed; the solution in this case being completed for very narrow wings by an application of slender wing theory. In case of the supersonic edges, a comparison is made with known two-dimensional results and also with results for the same triangular wing in reversed flow.

NACA TN 2388

AXISYMMETRIC SUPERSONIC FLOW IN ROTATING IMPELLERS. Arthur W. Goldstein. June 1951. 36p. diagrs. (NACA TN 2388)

General equations are developed for isentropic, frictionless, axisymmetric compressible flow in rotating impellers with blade forces eliminated in favor of the blade-surface function. The characteristic equations for supersonic flow are developed and a computing technique is utilized to find the effect of variations of design parameters on internal flow and work-input distribution.

NACA TN 2389

FATIGUE STRENGTHS OF AIRCRAFT MATERIALS. AXIAL-LOAD FATIGUE TESTS ON NOTCHED SHEET SPECIMENS OF 24S-T3 AND 75S-T6 ALUMINUM ALLOYS AND OF SAE 4130 STEEL WITH STRESS-CONCENTRATION FACTORS OF 2.0 AND 4.0. H. J. Grover, S. M. Bishop and L. R. Jackson, Battelle Memorial Institute. June 1951. 64p. diagrs., 14 tabs., photos. (NACA TN 2389)

Presents results of axial-load fatigue tests on notched specimens of 24S-T3 and 75S-T6 aluminum alloys and normalized SAE 4130 steel with stress-concentration factors of 2.0 (central circular hole, symmetrical edge notches, and fillets) and 4.0 (symmetrical edge notches and fillets). Fatigue tests were run at several levels of nominal mean stress. Results are compared with previous data for unnotched specimens.

NACA TN 2390

FATIGUE STRENGTHS OF AIRCRAFT MATERIALS. AXIAL-LOAD FATIGUE TESTS ON NOTCHED SHEET SPECIMENS OF 24S-T3 AND 75S-T6 ALUMINUM ALLOYS AND OF SAE 4130 STEEL WITH STRESS-CONCENTRATION FACTOR OF 5.0. H. J. Grover, S. M. Bishop and L. R. Jackson, Battelle Memorial Institute. June 1951. 19p. diagrs., 8 tabs. (NACA TN 2390)

Results are given of axial-load fatigue tests on notched specimens of 24S-T3 and 75S-T6 aluminum alloys and of normalized SAE 4130 steel. Each specimen was notched by edge notches designed to have a theoretical stress-concentration factor of 5.0. Tests were run at nominal mean stresses of 0, 10,000, 20,000, and 30,000 psi. Results extend previously reported data on unnotched specimens and specimens less severely notched.

NACA TN 2393

FLOW THROUGH CASCADES IN TANDEM. William E. Spraglin. June 1951. 44p. diagrs. (NACA TN 2393)

An exact treatment of the problem of finding the incompressible, inviscid two-dimensional flow around two cascades in tandem is presented. The analysis includes solutions of both the direct and the inverse problems. These problems are solved by conformally mapping the tandem cascade onto the region between two concentric circles in which region there are suitably placed flow singularities. Formulas for the velocity and the potential in the annular region are presented in a closed form by means of elliptic functions. The equations are presented in a form suitable for computation.

NACA TN 2397

INFLUENCE OF TENSILE STRENGTH AND DUCTILITY ON STRENGTHS OF ROTATING DISKS IN PRESENCE OF MATERIAL AND FABRICATION DEFECTS OF SEVERAL TYPES. Arthur G. Holms, Joseph E. Jenkins and Andrew J. Repko. June 1951. 39p. diagrs., photos., tab. (NACA TN 2397)

The influence of tensile strength and ductility on disk strength was investigated with material and fabrication defects present. In two cases an optimum compromise between tensile strength and ductility occurred at a ductility less than 15 percent elongation. In a third case, no influence of ductility was observed. When compared with performance previously observed for disks not containing irregularities, losses in disk strength for the defects investigated varied from 23 percent to 58 percent.

NACA TN 2398

SYNTHESIS OF CYCLOPROPANE HYDROCARBONS FROM METHYLCYCLOPROPYL KETONE. III - 2-CYCLOPROPYL-1-BUTENE, CIS AND TRANS 2-CYCLOPROPYL-2-BUTENE, AND 2-CYCLOPROPYLBUTANE. Vernon A. Slabey and Paul H. Wise. June 1951. 22p. diagrs., tab. (NACA TN 2398)

The hydrocarbons, 2-cyclopropyl-1-butene, cis and trans 2-cyclopropyl-2-butene, and 2-cyclopropylbutane were obtained in high purity and their physical properties and infrared spectra were determined. The olefins were isolated from the dehydration products of methylethylcyclopropylcarbinol, which was prepared by the reaction of ethylmagnesium bromide with methylcyclopropyl ketone. Catalytic hydrogenation of the 2-cyclopropylbutenes yielded 2-cyclopropylbutane.

NACA TN 2399

APPLICABILITY OF THE HYPERSONIC SIMILARITY RULE TO PRESSURE DISTRIBUTIONS WHICH INCLUDE THE EFFECTS OF ROTATION FOR BODIES OF REVOLUTION AT ZERO ANGLE OF ATTACK. Vernon J. Rossow. (Extension of TN 2250) June 1951. 28p. diagrs. (NACA TN 2399)

By comparing theoretical pressure distributions which include rotation effects, the hypersonic similarity rule is shown to be applicable to rotational as

well as irrotational flow. The influence of rotation on pressure distribution was shown to be a function of the similarity parameter only, for ogive cylinders. Charts are presented for rapid determination of pressure distributions over ogive cylinders for a wide range of Mach numbers and fineness ratios.

N-3330*

SOME SYNTHETIC THEOREMS OF ELASTICITY AND MATHEMATICAL PHYSICS; THEIR DEVELOPMENT FROM THE PRACTICAL POINT OF VIEW. THREE METHODS OF SUCCESSIVE APPROXIMATION. (Alcuni Teoremi Sintetici di Elasticita e di Fisica Matematica; Loro Sviluppo dal Punto di Vista Pratico; Tre Metodi di Successiva Approssimazione). Luigi Broglio. 30p. diagrs. (Trans. from Ministero della Difesa-Aeronautica. Monografie Scientifiche di Aeronautica 8).

Deals with four variational properties applicable to various physical problems. From these four theorems, various methods of numerical integration can be derived for many mathematical problems. Deals, in particular, with problems which are simply regarded as examples of application results, theorems and methods which can be used in elasticity, electromagnetism, theory of errors, dynamics of compressible fluids, hydrodynamics, optics, etc.

N-7103*

THE CALCULATION OF THE POTENTIAL FLOW PAST BLADES IN CASCADES. (Die Berechnung der Potentialströmung durch Schaufelgitter). W. Traupel. 45p. diagrs. (Trans. from Schweizer Archiv für angewandte Wissenschaft und Technik, v.10, no.12, 1944).

The present report deals with a new attempt at solving the problem of determining the potential flow for any given blade cascade which is obtained when the flow strikes the cascade at a specific angle. A problem taken from actual practice is solved as an example.

N-7831*

GENERALIZATION OF THEORY OF MIXING LEN LENGTHS TO FLOW AROUND CURVED PROFILES. (Obobshchenie Teorii Puti Smeshenia na obtekanie Krivolineinykh Profilei). A. M. Fainzileber. 7p. 5 tabs. (Trans. from Académie des Sciences de L'URSS, Comptes Rendus, v.58, no.4, 1947, p.555-558).

A linear shearing stress distribution through the boundary layer is used with the Kármán "mixing-length" equation to calculate velocity profiles. The calculated velocity profiles agree well with the experimental data given in the paper. The formula derived for the velocity distribution is used with known properties of the laminar sublayer to obtain a formula for the surface friction that also agrees with the experimental data given in the paper.

N-7986*

OPTICAL INVESTIGATIONS IN A PARTICULAR INHOMOGENEOUS MEDIUM. (Optische Untersuchungen in einem speziellen inhomogenen Medium). E. v. Heydebrand und der Lasa. 55p. diagrs. (Trans. from Annalen der Physik, Ser. 5, v.37, no.8, 1940, p.589-627).

This report treats the propagation of light in an isotropic medium, of which the refractive index is constant in parallel planes and obeys a linear variation law. Only problems which can be solved on the basis of the fundamental hypotheses of geometrical optics are treated. The main results found are the laws of the rays and their wave surfaces, their graphic representation for various locations of the source of light, and data on the produced illumination.

1102.21-260,pt.2*

Notre Dame U.
TORSIONAL STRENGTH OF STIFFENED D-SECTIONS, PART II. E. S. Kavanaugh. 1948. 46p. diagrs., photos., 9 tabs. (Notre Dame U.)

Torsional tests have been made on D-Sections of NACA shapes 0006, 0009, 0015, and 16-012 (a continuation of a project wherein the specimens tested had a constant cross-section). The effect on the ultimate strength of a change in the cross-section is not pronounced. The skin panel size determines the maximum load that the shape can carry. The effect of skin radius on this strength has been counteracted to some extent by the greater nose radius accompanying it. This has resulted in the average failing stresses of the larger sections being quite close to that of the smaller sections.

BRITISH REPORTS

N-4976*

Aeronautical Research Council (Gt. Brit.)
THE RESISTANCE OF ALUMINIUM AND BERYLLIUM BRONZES TO FATIGUE AND CORROSION-FATIGUE. D. G. Sopwith. 1950. 10p. diagrs., photos., 5 tabs. (ARC R &M 2486; ARC 4497)

The investigation of the fatigue and corrosion-fatigue resistance of special bronzes is extended to include (1) aluminium bronze (D.T.D.160), (2) beryllium bronze (2.25 percent Be), each in two heat-treated conditions. In neither material is the fatigue or corrosion-fatigue resistance appreciably higher in the heat-treated condition than in the condition as received. The fatigue strength in air of the beryllium bronze is almost independent of the ultimate stress, which varied from 32 to 81 ton/in.^{2}.

N-5844*

Forest Products Research Lab. (Gt. Brit.)
TRIALS OF TIMBERS FOR PLYWOOD MANUFACTURE. PROGRESS REPORT TEN. WHITE AFARA - TERMINALIA SUPERBA ENGL. AND DIELS. - WEST AFRICA. (35 POUNDS PER CUBIC FOOT AT 15% MOISTURE CONTENT). November 1950. 19p. 8 tabs. (Forest Products Research Lab.)

Results of tests on White Afara for use as plywood are presented. Trials included peeling, drying, edg-

ing and splicing, and glue-taking and pressing data. Yield measurements are included. The Afara would not meet the target of equal quantities of 3- and 5-ply veneer of Grade 2 plywood because of insufficient face quality veneer to give the balance of production within one species. Afara is straight grained and can be of good appearance when faced with either clear - or black-heart. There was however very little natural sheen to the consignment.

N-5845*

Forest Products Research Lab. (Gt. Brit.) TRIALS OF TIMBERS FOR PLYWOOD MANUFACTURE. PROGRESS REPORT ELEVEN. BINUANG - OCTOMELES SUMATRANA MIQ. - NORTH BORNEO. (27 POUNDS PER CUBIC FOOT AT 15 PERCENT MOISTURE CONTENT). January 1951. 17p. 8 tabs. (Forest Products Research Lab.)

Results of tests on Binuang for use as plywood are presented. The trials included peeling, drying, edging and splicing, and glue-taking and pressing data. Yield measurements are included. Binuang gave 76% of 3-ply and 92% of 5-ply veneer of Grade 2 plywood.

N-5846*

Forest Products Research Lab. (Gt. Brit.) MOISTURE RELATIONS OF COMPOSITE WOOD PRODUCTS. PROGRESS REPORT TWENTY-ONE. THE EQUALISATION OF MOISTURE CONTENT WITHIN A STACK OF DRIED VENEERS. J. F. S. Carruthers and A. M. Thomas. November 1950. 8p. diagrs., 3 tabs. (Forest Products Research Lab.)

Beech and Afara veneers were dried in a Merritt Dryad so as to produce variations in moisture content and were subsequently close-piled in a room whose humidity was so controlled as to give equilibrium moisture contents of 10%. At intervals, moisture content of samples was determined. The rate of change of content during process of evening was very slow, and the spread of moisture within a sheet of veneer decreased during storage. The rates were similar for the species tested.

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